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Title: Lookup Partitioning Storage System and Method

**INFORMAL CLAIM LISTING FOR EXAMINER'S AMENDMENT PER PHONE CONVERSATIONS**

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**Brief Summary of Selected Substantive Portions of this Response**

In telephone discussions with Applicants' representative Jacob Rohwer (the latest on September 17, 2009), the Examiner suggested an Examiner's Amendment to put claims into condition for allowability. A Word™ document listing of the proposed claims is included herein.

The claims are proposed as follows:

- Claims 14-17, 19, 20, 22, 25-30, 33, 50 and 52 are amended
- Claims 24, 32 and 51 are canceled
- Claims 53 and 54 are added

**Claims:**

**1-13. (Canceled)**

**14. (Proposed Amended)** A computer implemented method of managing access to a storage resource for one of a plurality of network-based applications in a multiple server storage system, the method comprising:

obtaining a resource identifier from a front end server;

utilizing the resource identifier to lookup, in a resource lookup store of a lookup partitioning service server, a partition of a storage server associated with the resource identifier;

in an event [[said]] the partition of [[said]] the storage server is associated with the resource identifier, granting access to the storage resource by providing a location of [[said]] the partition of [[said]] the storage server to [[said]] the front end server; and

in an event [[said]] no partition of [[said]] the storage server is [[not]] associated with the resource identifier:

failing to locate a mapping to the storage resource;

determining a load balancing factor for each storage partition of a plurality of storage partitions;

using the load balancing factors to determine a new storage partition in which a new storage resource should be created and creating [[a]] the new storage resource in [[a]] the new storage partition;

mapping the resource identifier to the new storage partition in the resource lookup store;

~~associating the resource identifier with said storage partition in said resource lookup store;~~ and

providing a location of [[said]] the new storage partition to [[said]] the front end server,

wherein determining a load balancing factor for each storage partition comprises:

given *n* storage partitions, determining the number of mapping counts *C* for each of the *n* storage partitions; and

calculating a load balancing factor ($LBF_m$) for each storage partition *m* using the following:

$$LBF_m = (1/C_m) / (1/C_1 + 1/C_2 + \ldots + 1/C_n).$$

**15.** **(Proposed Amended)** The method of Claim 14, wherein [[said]] the location of [[said]] the partition of [[said]] the storage server is on one of a plurality of storage servers.

**16.** **(Proposed Amended)** The method of Claim 14, ~~including a~~ wherein the plurality of storage partitions~~, said plurality including~~ include a primary storage partition and a redundant storage partition each containing [[said]] the storage resource.

**17.** **(Proposed Amended)** The method of Claim 16, wherein [[said]] the primary storage partition and [[said]] the redundant storage partition are each located on separate storage servers of [[said]] a plurality of storage servers.

**18.** **(Previously Presented)** The method of Claim 17, wherein, if the primary storage partition is unavailable, the storage server location is the redundant storage partition.

**19.** **(Proposed Amended)** The method of Claim 14, further comprising determining which lookup partitioning service server of a plurality of lookup partitioning service servers will provide wherein [[said]] the looked-up storage server location in response to the resource identifier.

**20.** **(Proposed Amended)** The method of Claim 19, wherein determining which lookup partitioning service server will provide [[said]] the looked-up storage server location comprises processing the resource identifier

through a hash function to provide a hashed resource identifier associated with a particular lookup partitioning service server.

**21. (Previously Presented)** The method of Claim 20, wherein each lookup partitioning service server is associated with a predetermined set of hashed resource identifiers.

**22. (Proposed Amended)** The method of Claim 14, further comprising moving the storage resource from one storage partition to ~~a new~~ another storage partition and updating [[said]] the resource lookup store with ~~said new~~ the another storage partition.

**23. (Canceled)**

**24. (Proposed Canceled)** ~~The method of Claim 14, further comprising calculating a load balancing factor for each storage partition of a plurality of storage partitions and using said load balancing factors to determine the storage partition in which said new storage resource should be created.~~

**25. (Proposed Amended)** The method of Claim 14~~Claim 24~~, wherein [[said]] the load balancing ~~factor is~~ are further based on a value selected from the

values consisting of: a mapping number~~, a count of mapping accesses,~~ and a manual weighting value.

**26. (Proposed Amended)** The method of Claim 14~~Claim 24~~ further comprising adjusting a manual weighting value to increase [[the]] a usage of ~~said one~~ of [[said]] a storage server~~servers~~.

**27. (Proposed Amended)** The method of Claim 14~~Claim 24~~, further comprising adjusting a manual weighting value to decrease [[the]] a usage of ~~said one~~ of [[said]] a storage server~~servers~~.

**28. (Proposed Amended)** A computer readable storage medium containing computer-executable instructions for performing [[the]] a method of managing access to a storage resource for one of a plurality of network-based applications in a multiple server storage system, the computer-executable instructions comprising instructions [[for]] comprising:

receiving a resource identifier associated with the storage resource from a front end server;

utilizing the resource identifier to lookup, in a resource lookup store of a lookup partitioning service server, a storage partition associated with the resource identifier;

in an event the storage partition is associated with the resource identifier:

locating the storage partition of a storage server; and

sending the location of [[said]] the storage partition ~~of said storage server~~ to [[said]] the front end server to grant access to [[said]] the storage resource; and

in an event the storage partition is not associated with the resource identifier:

failing to locate a mapping to the storage resource;

determining a load balancing factor for each storage partition of a plurality of storage partitions;

using the load balancing factors to determine a new storage partition in which a new storage resource should be created and creating [[a]] the new storage resource in [[a]] the new storage partition;

mapping the resource identifier to [[said]] the new storage partition in [[said]] the resource lookup store; and

sending a location of [[said]] the new storage partition to [[said]] the front end server.

wherein determining a load balancing factor for each storage partition comprises:

given *n* storage partitions, determining the number of mapping counts *C* for each of the *n* storage partitions; and

calculating a load balancing factor ($LBF_m$) for each storage partition *m* using the following:

$$LBF_m = (1/C_m) / (1/C_1 + 1/C_2 + \ldots + 1/C_n).$$

**29. (Proposed Amended)** The computer-readable storage medium ~~method~~ of Claim 28, further comprising determining which lookup partitioning service server of a plurality of lookup partitioning service servers will locate [[said]] the storage partition in response to [[said]] the resource identifier.

**30. (Proposed Amended)** The computer-readable storage medium ~~method~~ of Claim 28, further comprising relocating the storage resource from one storage partition to a different storage partition and updating the mapping of the resource identifier at [[said]] the lookup partitioning service server.

**31. (Canceled)**

**32. (Proposed Canceled)** ~~The method of Claim 28, further comprising calculating a load balancing factor for each storage partition of a plurality of storage partitions and using said load balancing factors to determine the storage partition in which said new storage resource should be created.~~

**33. (Proposed Amended)** The computer-readable storage medium ~~method~~ of Claim 28 ~~Claim 32~~, wherein [[said]] the load balancing ~~factor is~~ factors

are further based on a value selected from the values consisting of: a mapping number~~, a count of mapping accesses,~~ and a manual weighting value.

**34-49. (Canceled)**

**50. (Proposed Amended)** A lookup partitioning server comprising:

a processing unit;

at least one primary lookup partition; and

at least two redundant lookup partitions which mirror two respective different primary lookup partitions stored on other look-up partitioning servers;

a memory configured to store computer-executable instructions configured to manage access to a plurality of storage resources at a plurality of storage servers, the computer-executable instructions performing acts comprising:

receiving a resource identifier associated with a storage resource from a front end server;

utilizing the resource identifier to lookup, in a resource lookup store, a storage partition associated with the resource identifier;

in an event a particular storage partition is associated with the resource identifier:

locating the particular storage partition of a storage server; and

sending a location of the particular storage partition of the storage server to the front end server to grant access to the storage resource; and

in an event no particular storage partition is associated with the resource identifier:

failing to locate a mapping to the storage resource;

determining a load balancing factor for each storage partition of a plurality of storage partitions;

using the load balancing factors to determine a new storage partition in which a new storage resource should be created and creating the new storage resource in the new storage partition;

mapping the resource identifier to the new storage partition in the resource lookup store; and

sending a location of the new storage partition to the front end server,

wherein determining a load balancing factor for each storage partition comprises:

given *n* storage partitions, determining the number of mapping counts *C* for each of the *n* storage partitions; and

calculating a load balancing factor ($LBF_m$) for each storage partition *m* using the following:

$$LBF_m = (1/C_m) / (1/C_1 + 1/C_2 + \ldots + 1/C_n).$$

**51. (Proposed Canceled)** ~~The lookup partitioning server of claim 50, wherein determining a load balancing factor for each storage partition comprises:~~

~~given *n* storage partitions, determining the number of mapping counts *C* for each of the *n* storage partitions; and~~

~~calculating a load balancing factor ($LBF_m$) for each storage partition *m* using the following:~~

~~$LBF_m = (1/C_m) / (1/C_1 + 1/C_2 + \ldots + 1/C_n)$.~~

**52. (Proposed Amended)** The lookup partitioning server of Claim 50~~claim 51~~, wherein using the load balancing factors to determine a new storage partition comprises:

generating a random number *R*, where *R* is a real number between 0 and 1;

ranking the load balancing factors in ascending order;

locating a particular storage partition, where the sum of all the load balancing factors ranked lower than the load balancing factor corresponding to the particular storage partition is less than or equal to *R*, and the sum of all the load balancing factors ranked lower than the load balancing factor corresponding to the particular storage partition plus the load balancing factor corresponding to the particular storage partition is greater than *R*.

**53.** **(Proposed New)** The method of Claim 14,, wherein using the load balancing factors to determine a new storage partition comprises:

generating a random number *R*, where *R* is a real number between 0 and 1;

ranking the load balancing factors in ascending order;

locating a particular storage partition, where the sum of all the load balancing factors ranked lower than the load balancing factor corresponding to the particular storage partition is less than or equal to *R*, and the sum of all the load balancing factors ranked lower than the load balancing factor corresponding to the particular storage partition plus the load balancing factor corresponding to the particular storage partition is greater than *R*.

**54.** **(Proposed New)** The computer-readable storage medium of Claim 28, wherein using the load balancing factors to determine a new storage partition comprises:

generating a random number *R*, where *R* is a real number between 0 and 1;

ranking the load balancing factors in ascending order;

locating a particular storage partition, where the sum of all the load balancing factors ranked lower than the load balancing factor corresponding to the particular storage partition is less than or equal to *R*, and the sum of all the load balancing factors ranked lower than the load balancing factor

corresponding to the particular storage partition plus the load balancing factor corresponding to the particular storage partition is greater than $R$.

## REMARKS

Applicant thanks the Examiner for his reconsideration and suggestion of an Examiner's Amendment for allowance of the pending claims. Without conceding that such amendment is necessary, Applicant agrees to the Examiner's suggestion, and earnestly solicits allowance of the claims of this application.

**Formal Request for an Interview**

If the Examiner's reply to this communication is anything other than allowance of all pending claims, then we formally request an interview with the Examiner. The Examiner is encouraged to call the undersigned representative for the Applicant so that we can resolve any outstanding issues quickly and efficiently over the phone. Please contact me to schedule a date and time for a telephone interview that is most convenient for both of us. My contact information may be found below.

**Conclusion**

Applicant respectfully requests prompt issuance of the application. If any issues remain that prevent issuance of this application, the **Examiner is urged to contact the undersigned representative before issuing a subsequent Action**.

Respectfully Submitted,

Dated: September 17, 2009 By: /Jacob Rohwer 61229/

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